PATENT SPECIFICATION (11) 1 582 104

1 582 104

(21) Application No. 4332/78 (22) Filed 2 Feb. 1978 (19)
(31) Convention Application No. 8985/77 (32) Filed 8 Feb. 1977 in
(33) Australia (AU)
(44) Complete Specification published 31 Dec. 1980
(51) INT. CL.³ A01G 25/02 F16L 11/12
(52) Index at acceptance
A1D 3A2
F2P 1A14 1A27 1A28B 1A28C 1A3 1B7

(54) CONTINUOUS DRIP IRRIGATION TUBE

(71) We, REED IRRIGATION SYSTEMS PTY. LTD., a company incorporated under the laws of the State of South Australia, carrying on business as Manufacturers, whose registered office is at Philip Highway, Elizabeth, State of South Australia, Commonwealth of Australia, do hereby declare the invention, for which we pray that a patent may be granted to us, and the method by which it is to be performed, to be particularly described in and by the following statement:–

This invention relates to means for forming a continuous drip irrigation tube and to the tube formed therefrom.

It is known to provide low pressure drip irrigation tubes that emit measured quantities of water of their entire length at given intervals to provide the irrigation of row crops such as vegetables, sugar cane etc. One method of achieving this has been by the use of tubes having a twin wall configuration and small (that is 0·5 millimeres) holes to control the flow from the inner tube to the outer chamber. However this process has inherent problems in that it requires complex equipment to form or "drill" the holes such as by a laser beam, and this requires a means to drill the hole from the inner chamber to the outer chamber by drilling through the two chambers with the outer hole being subsequently blocked off.

Another method of providing drip irrigations tubes to emit measured quantities of water over their entire length at given intervals is to insert small orifices or capillary tubes (for example 0·75 millimetres' into the main tube or conduit, and depending on the length of these tubes the output from the capillary tubes can be controlled.

Also other methods of achieving drip irrigation are known, and these include the well known type of emitters, tortuous path membranes and the like.

According to one aspect of the present invention, there is provided means for forming a continous drip irrigation tube, said comprising an extruded strip section having opposite longitudinal edge portions and at least one capillary tube extruded integrally with said strip section, means for joining said edge portions together to form said strip section into a tubular construction to define a supply passage, said capillary tube having a wall which is common with the supply passage in the formed tube, said common wall having a plurality of inlet apertures for providing communication between the supply passage and the interior of the capillary tube, and said capillary tube having at least one outlet aperture in the wall thereof for providing communication between the interior of the capillary tube and the exterior of the drip irrigation tube.

According to another aspect of the present invention, there is provided a continuous drip irrigation tube formed from the means as defined in the preceding paragraph.

A preferred method of forming a low pressure drip irrigation tube includes the steps of extruding a flat strip section, the strip section having intermediate its width and running longitudinally of the section a series of capillary tubes, joining the edges of the flat strip to form a large supply passage or conduit, holes being formed through the wall of the capillary tubes at appropriate locations inside the tube to open into the now formed conduits, and further apertures being provided on the outsides of the capillary tubes to allow the water to drip from them onto the desired point of use or to flow into a distributor.

The inlet apertures can be spaced at relatively long intervals along the capillary tubes. The or each outlet aperture allows the water to drip from it or them on to the desired location of use of to feed distributor devices.

In one form the flat strip section can be simply extruded with the capillary tubes, for example three or more being formed centrally of the width of the flat strip these being of a relatively thin wall section.

The edges of the flat strip can be simply welded together to form the supply passage or conduit, or the outer edges can be formed with an interlocking configuration to allow the strip to be "zipped" together to form the tube. The interlocking configuration could be a bead like member formed along the

edge of one side of the strip, and a generally "U" shaped or semi-enclosed socket formed along the other longitudinal edge of the strip. In a preferred form one edge of the strip could have an arrowhead shape, and the other edge have a channel shaped section with inturned side edges so that the outer channel shaped section and the inturned edges of the channel grip and seal behind the outer edges of the arrowhead shape, so that when water is then passed into the so formed conduit or tube the pressure of the water causes the trailing edges of the arrowhead to seal against the corners of the inturned edges of the channel.

Preferably at least three capillary tubes can be extruded into the longitudinal strip and one, some or all of these can be used for the production of the drip feed at the required localities.

Thus there is the advantage is that in the field or in remote locations a drip tube can be simply tailored to the field requirements by simply forming apertures into the wall of the capillary tubes which are formed in the extrusion, these apertures being spaced at relatively long intervals along the tube, the tube is then formed by either welding or engaging the longitudinal edges of the strip, and similar apertures are formed in the opposite side of the capillary tube, these apertures being preferably centrally located between any two of the first mentioned apertures. This allows the water to pass from the water carrying conduit into the capillary tube section thus reducing the pressure during its outlet passage.

Where a larger number of such capillary tubes are formed in the wall of the water carrying conduit, similar apertures can be cut, but at varying increments, thus giving options to obtain long capillary passages, for example one metre or more, but as for many crops the outlets need to be at 30 centrimetres spacing three such capillary tubes would normally meet the requirements.

Thus the apertures can be formed as desired, and if no apertures are required for a certain distance of a number of metres, then no disadvantage results by not forming any apertures therein.

Also as the outlet spacings can be varied to suit the topography or friction loss problems of the water carrying conduit, the tube can also be either welded or formed spirally or welded longitudinally and can also be tapered over its length to suit the hydraulic variations thus maintaining uniform discharge over the length of the tube and in case of spiral winding also increasing the strength of the tube.

A further alternative of making the apertures is to drive a tubular barbed rivet, the rivet being hollow and having an opening actually along its length but terminating at the head of the rivet and with an aperture opening sideways out of the shank of the rivet so that the rivet can be passed through the capillary tube section from the outside so as to allow water to pass from the water carrying conduit into the capillary tube, with the head of the rivet sealing the outer edge or wall of the capillary tube. Alternatively the rivet can also be of a flexible nature with such a configuration that a measure of pressure compensation can result during the passage of water through the device.

For a better understanding of the invention and to show how the same may be carried into effect, reference will now be made, by way of example, to the accompanying drawings, in which:–

Figure 1 is an end elevation of a strip,

Figure 2 shows it formed into a tube,

Figure 2 is a fragmentary end view of part of the strip showing three of the capillary tubes,

Figure 4 is a longitudinal section on a capillary tube as on line 4–4 of Figure 3,

Figure 5 is a plan of a form of the strip showing the edges formed to be welded together,

Figure 6 shows a variation of the strip formed into a tube with a helical formation, and

Figures 7 and 8 are fragmentary sectional views showing inlet and outlet means which can be used in place of simple apertures.

In Figure 1 is shown a strip 10 having a barb formation 11 at one edge and a barb-receiving socket formation 12 at the opposite edge whereby the edges may be joined as shown in Figure 2. The edges could however be plain as shown in Figure 5 and be welded together or otherwie joined.

The strip has on it a sereis of capillary tubes 14 formed as the strip is extruded.

he capillary tubes 14 have on their outer walls a series of transverse dimples 15 as shown in Figure 3 which serve to cause turbulence to flow through the capillary tubes to aid flow restriction, and an aperture 16 in the main wall of the strip 10 allows water to flow into the capillary, the water leaving the capillary through the apertures 17.

The capillary tubes 14 have a common wall 18 with the tube 10 and it is this wall which is apertured.

In the form shown in Figure 5 the dimples are not shown as these are not necessarily always present.

In Figure 6 the strip is shown completed by winding the strip helically as the edges are joined.

Figure 7 shows how the apertures 16 may be formed by inserting a plug 20 which has a piercing end 21 and has a hollow 22 opening through an aperture 23 into the capillary 14 to allow a flow of water thereinto. The aperture 24 is sealed by the plug 20.

In Figure 8 is shown how the aperture 17 can be formed by an outlet member 26 which has a piercing barbed end 27 which firmly

engages the outer wall of the capillary 14 to provide a take-off point for the water leaving he capillary.

WHAT WE CLAIM IS:—

1. Means for forming a continuous drip irrigation tube, said means comprising an extruded strip section having opposite longitudinal edge portions and at least one capillary tube extruded integrally with said strip section, means for joining said edge portions together to form said strip section into a tubular construction to define a supply passage, said capillary tube having a wall which is common with the supply passage in the formed tube, said common wall having a plurality of inlet apertures for providing communication between the supply passage and the interior of the capillary tube, and said capillary tube having at least one outlet aperture in the wall thereof for providing communication between the interior of the capillary tube and the exterior of the drip irrigation tube.

2. Means as claimed in claim 1 wherein there are a plurality of said capillary tubes, each as claimed in claim 1.

3. Means as claimed in claim 1 or 2, wherein the or each capillary tube has a plurality of spaced dimples along its length to restrict but not block off flow through that capillary tube.

4. Means as claimed in claim 1, 2 or 3, including a hollow outlet member having a piercing barbed end inserted through an aperture in the wall of the or one of the capillary tube(s) remote from its common wall, the piercing end terminating in the associated capillary tube without piercing the common wall of that tube.

5. Means as claimed in any one of the preceding claims and including a plug with a piering end insertable through an aperture in the or one of the capillary tube(s) and for extending through an aperture in said common wall, said plug having a passageway which is intended to extend from inside said supply passage to open into said capillary tube.

6. Means as claimed in any one of the preceding claims, wherein one of said edge portions of the strip section has on it a barb formation and the other of said edge portions has a socket formation whereby the strip section can be formed into said tubular construction by engaging said barb formation in said socket formation.

7. Means for forming a continuous drip irrigation tube, substantially as hereinbefore described with reference to Figures 1 to 5 or Figure 6, each with or without the modification of Figure 7 and/or of Figure 8 of the accompanying drawings.

8. A continuous drip irrigation tube formed from the means as claimed in any preceding claim.

9. A continouous drip irrigation tube as claimed in claim 8, wherein the or each capillary tube is on the exterior of said tubular construction.

10. A continuous drip irrigation tube, substantially as hereinbefore described with reference to Figures 1 to 5 of Figure 6, each with or without the modification of Figure 7 and/or of Figure 8 of the accompanying drawings.

HASELTINE, LAKE & CO.,
Chartered Patent Agents,
Hazlitt House,
28, Southampton Buildings,
Chancery Lane, London
WC2A 1AT,
also at
Temple Gate House,
Temple Gate, Bristol BS1 6PT,
and
9, Park Square, Leeds LS1 2LH,
Yorks.
Agents for the Applicants.

Printed for Her Majesty's Stationery Office by Burgess & Son (Abingdon), Ltd.—1980.
Published at The Patent Office, 25 Southampton Buildings, London, WC2A 1AY,
from which copies may be obtained.

1582104 COMPLETE SPECIFICATION
2 SHEETS *This drawing is a reproduction of the Original on a reduced scale*
Sheet 1

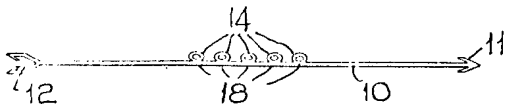

FIG 1

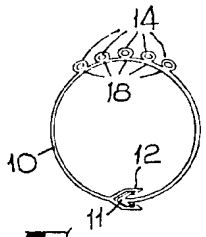

FIG 2

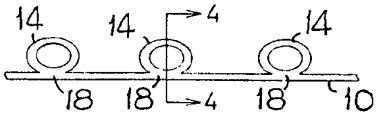

FIG 3

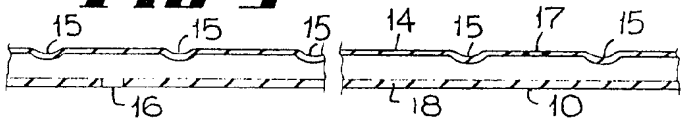

FIG 4

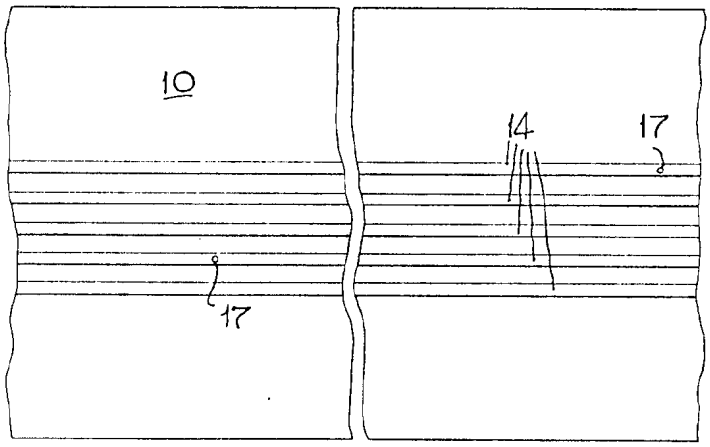

FIG 5

1582104 COMPLETE SPECIFICATION

2 SHEETS *This drawing is a reproduction of the Original on a reduced scale*

Sheet 2

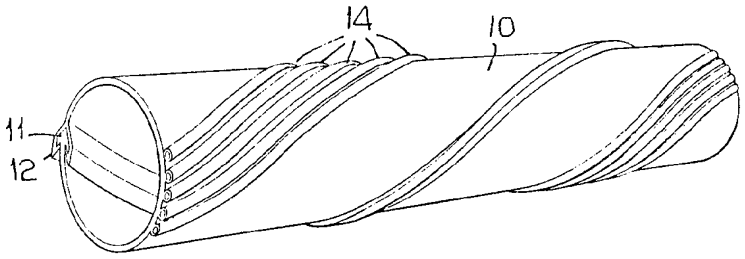

FIG 6

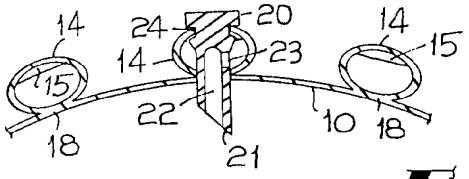

FIG 7

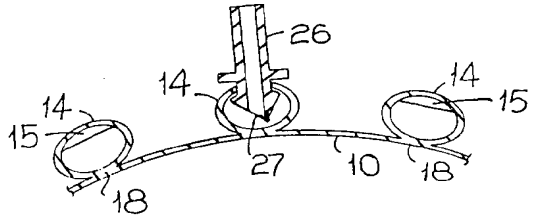

FIG 8